REMARKS

In the Office Action, the Examiner rejected claims 1, 3, 5, 11, 14-16, 18, 24, and 26 pursuant to 35 U.S.C. §102(e) as anticipated by Halmann, et al. (US 6,526,163). Claim 2 was rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. in view of Zar (A Scan Conversion Engine . . .). Claims 4 and 17 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. in view of Hossack, et al. (US 6,352,511). Claims 6 and 19 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. in view of Okerlund, et al. (US 6,690,371). Claims 7 and 20 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. in view of Drebin, et al. (US 4,835,712). Claims 9 and 22 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. in view of Swerdloff (US 5,483,567). Claims 12, 13, and 25 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. Claim 27 was rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Halmann, et al. in view of Edic, et al. (US 2004/0136490).

Claims 8, 10, 21, and 23 were objected to as being allowable if amended into independent form.

Applicants respectfully request reconsideration of the rejections of claims 1-7, 9, 11-20, 22, and 24-27, including independent claims 1 and 14.

Independent claim 1 recites a processor operable to identify acquired ultrasound data as a function of the values where a look-up table has the values corresponding to a spatial conversion from the display format to the acquisition format.

Halmann, et al. do not disclose this limitation. Halmann, et al. note that a CPU generates the scan converter tables necessary to convert scanned data from the polar coordinate system to the Cartesian coordinate system where the tables are dependent on the mode of operation (col. 7, lines 54-59). Scan conversion is performed with interpolation and the like (col. 8, line 53-col. 9, line 4). Halmann, et al. do not provide further details for the tables, but indicate that the tables convert the data. Halmann, et al. do not use values of the table to identify ultrasound data where the display values are interpolated from the identified ultrasound data. There is no teaching that acquired ultrasound data is identified as a function of the values of the look-up table.

Claim 1 recites the table having values corresponding to a spatial conversion from the display format to the acquisition format. Halmann et al. convert polar coordinates into Cartesian coordinates (col 7, lines 55-57; and col 8, lines 64-65), not a look-up table used for the conversion of Cartesian coordinates to the polar coordinates.

Independent claim 14 is allowable for similar reasons as claim 1.

Dependent claims 2-7, 9, 11-13, 15-20, 22, and 24-27 depend from claims 1 and 14, and are allowable for the same reasons as the corresponding base claim. Further limitations patentably distinguish from the cited references.

Claims 3 and 16 recite determining the display coordinates of interest. The Examiner cites to col. 8, lines 4-9 of Halmann, et al. However, col. 8, lines 4-9 show scan or polar coordinate data, not display coordinates. Claim 3 also recites identifying the ultrasound data by inputting the display coordinates into the look-up table. The cited portions of Halmann, et al. do not disclose use of the table in this way.

Claims 5 and 18 recite the display coordinates of interest input to the look-up table being coordinates for a plurality of rays through the volume. Halmann, et al. disclose a raycasting/volume rendering module 201, but this module 201 is not shown to work with the tables of the separate scan conversion module 207.

Claim 11 recites a graphics processing unit (GPU). A GPU is a term of art for hardware designed specifically for graphics processing. The CPUs of Halmann, et al. are not GPUs merely because they process graphics. A person of ordinary skill in the art would understand that a CPU is not a GPU. Given the versatile processing taught by Halmann, et al. (see abstract), a person of ordinary skill in the art would use a CPU, not a GPU.

Claim 15 recites outputting Polar coordinates interpolated from the look-up table. Halmann, et al. interpolate ultrasound data, but do not disclose outputting interpolated Polar coordinates from the table.

Claim 26 recites generating a two-dimensional look-up table (LUT) with acquisition format coordinates for each coordinate of a Cartesian volume. Halmann, et al. treat volume rendering separately from scan conversion. There is no disclosure of a LUT for coordinates of a Cartesian volume.

Claim 2 recites values of the look-up table being Polar coordinates where the look-up table is indexed by integer Cartesian coordinates. Halmann, et al. do not disclose coordinate values in the look-up table, and do not disclose Polar coordinates as the values of the look-up table indexed by Cartesian coordinates. Zar discloses bilinear interpolation of ultrasound data, not a look-up table of coordinates.

Claim 4 recites the processor operable to determine a plane through a volume as the display coordinates where the display coordinates are input to the look-up table. Hossack, et al. show arbitrary plane display for a volume, but do not use the coordinates of the plane as an input to the look-up table. Halmann, et al. treat volume rendering and scan conversion separately, so do not use coordinates of a plane in a volume as input to the scan conversion table. Claim 17 is allowable for similar reasons.

Claims 6 and 19 are allowable for the same reasons as claim 5. Claims 6 and 19 are also allowable because a person of ordinary skill in the art would not have used the cited rendering of Okerlund, et al. with Halmann, et al. The cited section for alpha blending of Okerlund, et al. teaches a hardware based RGBA approach (col. 7, lines 4-19). Alpha blending is provided using hardware acceleration. However, Halmann, et al. desire versatility so use programmable CPUs to avoid hardware specialization (col. 2, lines 42-52). A person of ordinary skill in the art would not have used the hardware acceleration based alpha blending of Okerlund, et al. with the general programming approach of Halmann, et al.

Claims 9 and 22 recite an additional look-up table corresponding to conversion from the display format to the acquisition format across multiple acquisition planes. Swerdloff discloses multiple tables, but not a table for conversion across multiple planes.

Claim 12 recites a flag, and an integer sum. As noted in the specification, an integer sum allows indication of spatial relationship relative to other table entries. Halmann, et al. do not suggest any format for the look-up table, and certainly do not disclose an integer sum, a flag or fixed-point values. These values are chosen to allow table based identification of data rather than scan conversion of the data. Selective scan conversion of only the samples that contribute to the rendering result without having to scan convert occluded data is provided by the recited table variables. A person of ordinary skill in the art would not have provided the listed classes as a mere design choice.

Claims 13 and 25 are allowable for similar reasons as claim 12. Claim 13 also recites using the flag of the look-up table for location outside of the scanned region. Halmann et al. desire to scan convert all of the data (col. 9, lines 4-13).

CONCLUSION:

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call Craig Summerfield at (312) 321-4726.

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